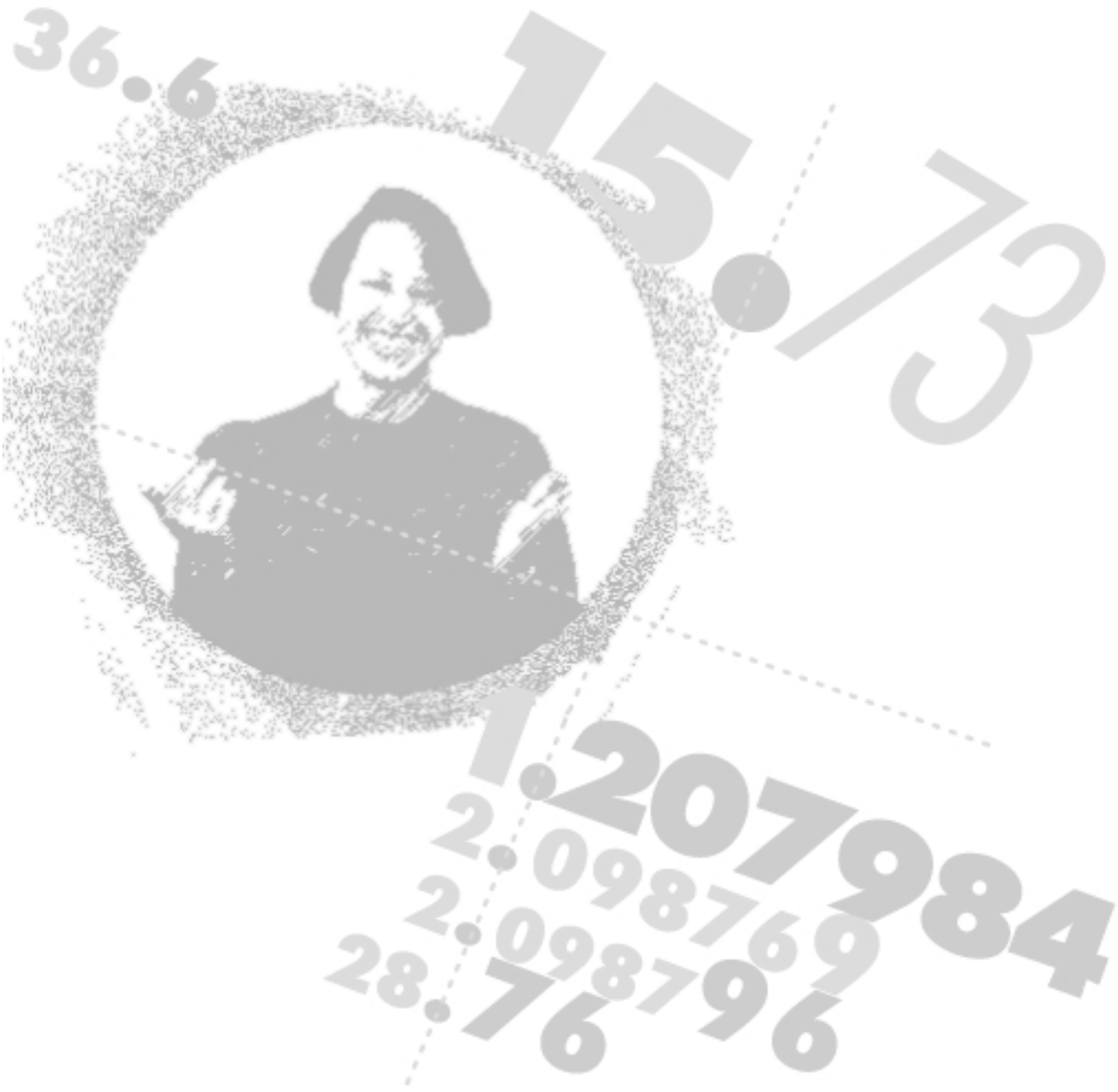
LESSON F2.3 – DECIMALS I



Overview

You have already worked with fractions. Now you will learn about decimal notation, another way to represent fractions.

In this lesson you will study decimal notation and how to find the place value of each digit in a decimal number. You will also learn how to order and how to round decimals. Then you will learn how to write some fractions as decimals and how to write some decimals as fractions.

Before you begin, you may find it helpful to review the following mathematical ideas which will be used in this lesson. To help you review, you may want to work out each example.

To see these Review problems worked out, go to the Overview module of this lesson on the computer.

Review 1 Using a grid to picture a fraction

a. In Figure 1, three out of ten parts are shaded. What fraction of the grid is shaded?
Answer: $\frac{3}{10}$

b. In the 100-square grid shown in Figure 2, seventeen out of one hundred parts are shaded. What fraction of the grid is shaded?
Answer: $\frac{17}{100}$

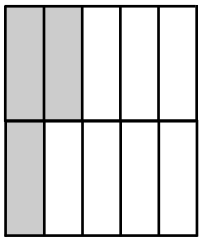


Figure 1

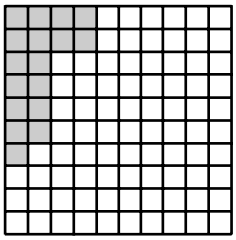


Figure 2

Review 2 Using a place value chart

What is the place value of the 5 in the whole number 3524?
Answer: 500

Review 3 Using these ordering symbols: $<, \leq, >, \geq$

Which of the following is a false statement?
$23 < 35$ $23 > 35$ $23 \leq 35$ $35 \geq 23$
Answer: $23 > 35$

Review 4 Ordering whole numbers

Which is greater, 27,893 or 27,864?
Answer: 27,893

Review 5 Rounding whole numbers

Round the number 45,629 to the nearest hundred.
Answer: 45,600

Review 6 Writing equivalent fractions

Write a fraction with denominator 100 that is equivalent to the fraction $\frac{3}{4}$.
Answer: $\frac{75}{100}$

Explain

In Concept 1: Decimal Notation, you will find a section on each of the following.

- ***Decimal Notation***
- ***The Place Value of Digits in a Decimal Number***
- ***How to Read and Write Decimal Numbers***
- ***How to Order Decimal Numbers***
- ***How to Round Decimal Numbers***

CONCEPT 1: DECIMAL NOTATION

Decimal Notation

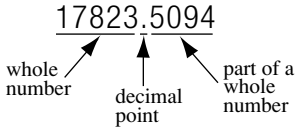
Decimal notation is used to represent whole numbers and parts of whole numbers.

For example, look at this decimal number: 17823.5094

The dot is called the decimal point.

The digits to the left of the decimal point represent the whole number.

The digits to the right of the decimal point represent part of a whole number, that is, a number between 0 and 1. In this case, the digits represent the fraction $\frac{5094}{10000}$.



When a decimal number has four digits after the decimal point, as in 17823.5094, the number is said to have four decimal places. When a decimal number has two digits after the decimal point, as in 327.56, the number is said to have two decimal places.

You can use various pictures to illustrate decimals. For example, you can picture one decimal place, such as 0.4, by using a grid with 10 strips as shown in Figure 3.

Figure 3

You can describe what the shaded strips in this picture represent in three different ways.

in words: four out of ten

as a fraction: $\frac{4}{10} = \frac{2}{5}$

as a decimal: 0.4

You can picture two decimal places, for example 0.32, by using a grid with 100 squares as shown in Figure 4.

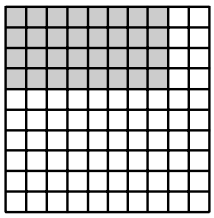


Figure 4

You can describe what the shaded squares in this picture represent in three different ways.

in words: thirty-two out of one hundred

as a fraction: $\frac{32}{100} = \frac{8}{25}$

as a decimal: 0.32

Example 1

You may find these Examples useful while doing the homework for this section.

1. Here is the amount of money Maria has in savings: $1426.37

   a. Which digits in this amount represent the whole number of dollars?
   1426 is the whole number of dollars. Maria has 1426 whole dollars.

   b. Which digits in this amount represent the part of a dollar?
   37 represents 0.37 or 37 cents. 37 cents is thirty-seven hundredths of a whole dollar. You can also write the decimal 0.37 as the fraction $\frac{37}{100}$.

Example 2

2. a. Represent the shaded part of the 100-square grid shown in Figure 5 as a fraction of the whole grid.
   The shaded part is represented by the fraction $\frac{1}{100}$.

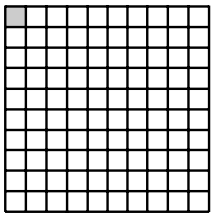


Figure 5

   b. Represent the shaded part of the 100-square grid shown in Figure 5 as a decimal.
   The shaded part is represented by the decimal 0.01.

   c. Draw a 100-square grid and shade squares on the grid to represent the decimal 0.17
   An answer is shown in Figure 6.

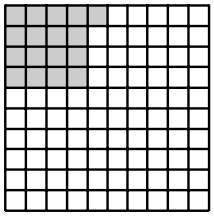


Figure 6

   d. Represent the shaded part of the grid shown in Figure 6 as a fraction of the whole grid.
   The shaded part is represented by the fraction $\frac{17}{100}$.

Example 3

3. Maria is painting her kitchen. She mixes 3 parts yellow paint with 5 parts white paint and 2 parts green paint to get 10 parts of the color she wants. The shaded part of the 10-grid in Figure 7 represents the amount of yellow paint in Maria's mixture.

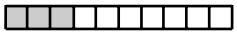


Figure 7

   a. Represent the amount of yellow paint in Maria's mixture in three ways:
   • in words
   • as a fraction
   • as a decimal
   In words, you can represent the amount of yellow paint in Maria's mixture as 3 out of 10.
   As a fraction, you can write $\frac{3}{10}$.
   As a decimal, you can write 0.3.

   b. Now represent the amount of paint that is not yellow:
   • in words
   • as a fraction
   • as a decimal
   In words, you can represent the amount of paint that is not yellow in Maria's mixture as 7 out of 10.
   As a fraction, you can write $\frac{7}{10}$.
   As a decimal, you can write 0.7.

The Place Value of Digits in a Decimal Number

A place value chart can help you understand the value of each digit in a given number. For example, Figure 8 shows the number 537.26 in a place value chart:

Notice how you can label each column (or place) using fractions or decimals or words.

Each time you move one column to the left, the new place value is 10 times the previous place value.

Each time you move one column to the right, the new place value is $\frac{1}{10}$ times the previous place value.

Place Value Chart				
5	3	7	2	6
100	10	1	$\frac{1}{10}$	$\frac{1}{100}$
100.0	10.0	1.0	0.1	0.01
hundreds	tens	ones	tenths	hundredths

Figure 8

Look at 537, the numbers in the columns to the left of the decimal point. They represent a whole number.

The 7 is in the ones place, so the value of the 7 is $7 \times 1 = 7$.
The 3 is in the tens place, so the value of the 3 is $3 \times 10 = 30$.
The 5 is in the hundreds place, so the value of the 5 is $5 \times 100 = 500$.

Now look at 26, the numbers in the columns to the right of the decimal point. They represent part of a whole number.

The 2 is in the tenths place, so the value of the 2 is $2 \times \frac{1}{10} = \frac{2}{10} = 0.2$.

The 6 is in the hundredths place, so the value of the 6 is $6 \times \frac{1}{100} = \frac{6}{100} = 0.06$.

So, $537.26 = (5 \times 100) + (3 \times 10) + (7 \times 1) + (2 \times \frac{1}{10}) + (6 \times \frac{1}{100})$

$= 500 + 30 + 7 + \frac{2}{10} + \frac{6}{100}$

$= 500 + 30 + 7 + 0.2 + 0.06$

You may find these Examples useful while doing the homework for this section.

Example 4

4. Here is the amount of money Maria has in her savings account: $1426.37

   a. What is the number in the tens place (or column)?
   2 is the number in the tens place.

   b. What value does the number in the tens place represent?
   The 2 represents $2 \times \$10 = \$20$.

   c. What is the number in the hundreds place (or column)?
   4 is the number in the hundreds place.

   d. What value does the number in the hundreds place represent?
   The 4 represents $4 \times \$100 = \$400$.

Example 5

5. Here again is the amount of money Maria has in her savings account: $1426.37

   a. What is the number in the tenths place (or column)?
   3 is the number in the tenths place.

   b. What value does the number in the tenths place represent?
   The 3 represents $3 \times \$\frac{1}{10} = \$\frac{3}{10} = \$0.3$.

When you work with money, you usually think of $0.3 as 30 cents.

c. What is the number in the hundredths place (or column)?
7 is the number in the hundredths place.

d. What value does the number in the hundredths place represent?
The 7 represents $7 \times \$\frac{1}{100} = \$\frac{7}{100} = \$0.07$.

6. Write out 2.67 by putting the correct value in each blank. **Example 6**

2.67 = (2 × _____) + (6 × ____) + (7 × _____)

The first blank place is the ones place, the second is the tenths place, and the third is the hundredths place.

So write $2.67 = (2 \times 1) + (6 \times \frac{1}{10}) + (7 \times \frac{1}{100})$
$= (2 \times 1) + (6 \times 0.1) + (7 \times 0.01)$

7. Using place values, write out the number 1426.37. **Example 7**

$1426.37 = (1 \times 1000) + (4 \times 100) + (2 \times 10) + (6 \times 1) + (3 \times \frac{1}{10}) + (7 \times \frac{1}{100})$
$= 1000 + 400 + 20 + 6 + \frac{3}{10} + \frac{7}{100}$
$= 1000 + 400 + 20 + 6 + 0.3 + 0.07$

8 a. When you put the decimal number 1327.548 in a place value chart, what number goes in the hundredths column? **Example 8**
The number 4 goes in the hundredths column.

b. When you put the decimal number 1327.548 in a place value chart, what number goes in the thousands column?
The number 1 goes in the thousands column.

How to Read and Write Decimal Numbers

Here's how to read (or write in words) a decimal number:
- Read the whole number part of the number.
- Say "and" for the decimal point.
- Read the decimal part as a counting number.
- Say the name of the place value for the right-most digit.

For example, the decimal number 23.015 is read "twenty-three and fifteen thousandths".

You can also go from a decimal number written in words to the decimal number.

For example, five hundred forty-seven and sixty-three hundredths is written as 547.63.

9. Write in words the decimal number 26.438. **Example 9**

- *Write the whole number part.* — *twenty-six*
- *Write "and" for the decimal point.* — *and*
- *Write the decimal part as a counting number.* — *four hundred thirty-eight*
- *Write the name of the place value for the right-most digit.* — *thousandths*

So, in words you can write 26.438 as twenty-six and four hundred thirty-eight thousandths.

You may find these Examples useful while doing the homework for this section.

Example 10

10. The decimals 0.3, 0.30 and 0.300 represent the same number.
Write each decimal in words.

In the decimal 0.3, the right-most digit is in the tenths place. So write three tenths.
In the decimal 0.30, the right-most digit is in the hundredths place.
So write thirty hundredths.
In the decimal 0.300, the right-most digit is in the thousandths place.
So write three hundred thousandths.

Example 11

11. Write each of the following as a decimal number:

a. five and three hundred twenty thousandths
5 is the whole number to the left of the decimal point.
320 is to the right of the decimal point.
The 0 must be in the thousandths place.
So write 5.320.
This also represents the decimal number 5.32.

b. five and three hundred two thousandths
5 is the whole number to the left of the decimal point.
302 is to the right of the decimal point.
The 2 must be in the thousandths place.
So write 5.302.

c. five and thirty-two thousandths
5 is the whole number to the left of the decimal point.
32 is to the right of the decimal point.
The 2 must be in the thousandths place.
So you have to insert a zero in the tenths place.
Write 5.032.

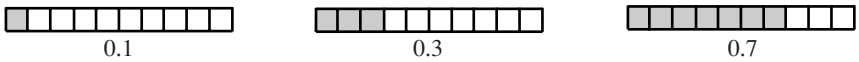
How to Order Decimal Numbers

When you order decimals, you arrange them from least to greatest, or from greatest to least.

Remember:
> means "is greater than"
< means "is less than"
≥ means "is greater than or equal to"
≤ means "is less than or equal to"

To order decimals that all have the same number of decimal places, figure out which decimal is greatest and which is least by ignoring the decimal points and comparing the numbers.

For example, 0.3, 0.1 and 0.7 are all tenths. To order from least to greatest, since $1 < 3 < 7$, write $0.1 < 0.3 < 0.7$. You can picture this ordering by using three 10-strips, as shown.



To order 0.3, 0.1, and 0.7 from greatest to least, write $0.7 > 0.3 > 0.1$.

To order decimals that have different numbers of decimal places, first attach final zeros until the numbers have the same number of decimal places. Then ignore the decimal points and compare the numbers.

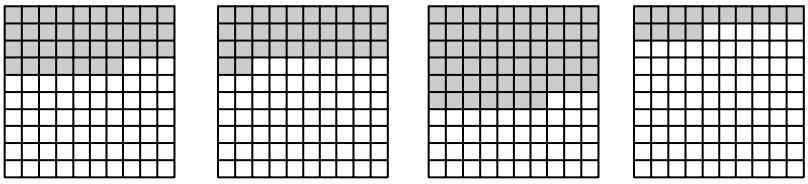
For example, to order 0.3, 0.13, and 0.315 from least to greatest, first attach zeros until each number has three decimal places. The numbers become 0.300, 0.130, and 0.315. Then ignore the decimal points and compare the numbers.

Since $130 < 300 < 315$, write $0.130 < 0.300 < 0.315$. That is, $0.13 < 0.3 < 0.315$.

Example 12

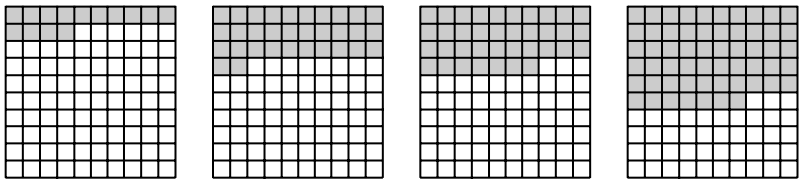
You may find these Examples useful while doing the homework for this section.

12. The 100-square grids below represent the decimal numbers 0.37, 0.32, 0.57 and 0.14. Use these grids to order the decimal numbers from least to greatest.



0.37 0.32 0.57 0.14

Start by arranging the 100-square grids in order, with the grid that contains the least amount of shading first.



0.14 0.32 0.37 0.57

From the grids you can see that when you order the decimal numbers from least to greatest, you get 0.14 < 0.32 < 0.37 < 0.57.

Example 13

13. Without using pictures, order the same four decimals numbers 0.37, 0.32, 0.57, and 0.14 from least to greatest.

When the decimals have the same number of decimal places you can ignore the decimal points and compare the numbers. In this example, you get 14 < 32 < 37 < 57.

So 0.14 < 0.32 < 0.37 < 0.57.

Example 14

14. Order the decimal numbers 0.3 and 0.13 from greatest to least.

These two numbers have a different number of decimal places.

One way to order the numbers is to use pictures.

0.3 *0.13*

You can see that the first picture has a larger shaded area. So 0.3 > 0.13.

Now here's how to answer the same question without the pictures.

Attach final zeros until the two numbers have the same number of decimal places. You get 0.30 and 0.13. Now ignore the decimal points and arrange the numbers in order. You get 30 > 13.

So 0.30 > 0.13. That is, 0.3 > 0.13.

Example 15

15. Order the fractions $\frac{3}{10}$, $\frac{31}{100}$, and $\frac{13}{100}$ from greatest to least.

You can answer this question by writing the fractions as decimal numbers before placing them in order.

$\frac{3}{10} = 0.3$ $\frac{31}{100} = 0.31$ $\frac{13}{100} = 0.13$

Now write each decimal number with the same number of decimal places. You get 0.30, 0.31, and 0.13.

Since 31 > 30 >13, it follows that 0.31 > 0.30 >0.13. So $\frac{31}{100} > \frac{3}{10} > \frac{13}{100}$.

Example 16

16. Arrange the digits 3, 7, 1, and 2 to form the decimal number 0._ _ _ _ with the greatest possible value.

Put the largest digit in the tenths place: 0.7 _ _ _
The next largest digit goes in the hundredths place: 0.73 _ _
Then the next largest digit goes in the thousandths place: 0.732 _
Finally, the remaining digit goes in the ten-thousandths place: 0.7321

So, using the digits 3, 7, 1, and 2, the decimal number 0._ _ _ _ with the greatest value is 0.7321.

How to Round Decimal Numbers

Rounding is used when you want to approximate a decimal number with another decimal number that has a specific number of decimal places.

For example, to round 0.62 to the nearest tenth, write 0.6.

To round 0.67 to the nearest tenth, write 0.7

To round to the nearest tenth:
- Locate the digit in the tenths place.
- Look at the digit just to the right.
  - If that digit is equal to 5 or greater than 5, round up by replacing the digit in the tenths place with the next larger digit, and dropping all digits to the right.
  - If that digit is less than 5, round down by leaving the digit in the tenths place as it is, and dropping all digits to the right.

Similarly, you can round to the nearest hundredth or thousandth by applying these steps to the appropriate decimal place.

You may find these Examples useful while doing the homework for this section.

Example 17

17. Round the decimal number 0.43 to the nearest tenth.

The digit in the tenths place is 4.
The digit just to the right is 3.
Since 3 is less than 5, round down.
Leave the 4 alone and drop the 3. You get 0.4.

You can also picture this on a number line by observing that 0.43 is between 0.4 and 0.5, and is closer to 0.4. See Figure 9.

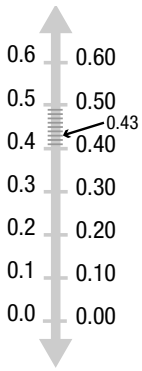


Figure 9

18. Maria's son uses his calculator to calculate the sales tax on a candy bar and a can of soda. The calculator shows $0.081375. Round this amount to the nearest cent.

Example 18

The nearest cent is the nearest hundredth of a dollar. So round to the hundredths place.
The digit in the hundredths place is 8.
The digit just to the right is 1.
Since 1 is less than 5, round down.
Leave the 8 alone and drop the 1375.
The sales tax rounded to the nearest hundredth is $0.08.

19. Maria's son also uses his calculator to calculate his batting average on the school baseball team. The calculator shows 0.3687563. Round this average to the nearest thousandth.

Example 19

The digit in the thousandths place is 8.
The digit just to the right is 7.
Since 7 is greater than 5, round up.
Replace the 8 with 9 and drop the 7563.
His batting average rounded to the nearest thousandth is 0.369.

Explain

In Concept 2: Converting, you will find a section on each of the following.

- **Decimals and Fractions on the Number Line**
- **How to Write Some Decimal Numbers as Fractions**
- **How to Write Some Fractions as Decimals**

CONCEPT 2: CONVERTING

Decimals and Fractions on the Number Line

You can use a number line with two scales to show how a fraction and a decimal are related. For example, the number line shown in Figure 10 is marked with a fraction scale and a decimal scale.

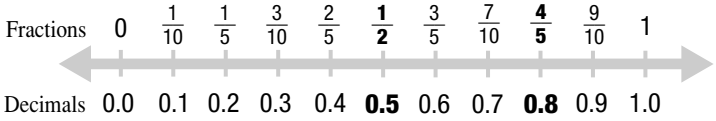


Figure 10

On it, you can see that the fraction $\frac{1}{2}$ and the decimal 0.5 are two different ways of representing the same number. The value of the number is the same whether you write it as a fraction or as a decimal.

Similarly the fraction $\frac{4}{5}$ and the decimal 0.8 represent the same number.

You may find these Examples useful while doing the homework for this section.

Example 20

20. Use the grids shown in Figures 11 and 12 to compare the decimal 0.25 and the fraction $\frac{1}{4}$.

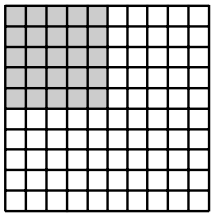


Figure 11

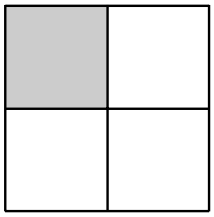


Figure 12

You can see that the same area is shaded in the two grids. So the decimal 0.25 and the fraction $\frac{1}{4}$ represent the same number. That is, 0.25 = $\frac{1}{4}$.

Example 21

21. Label the fraction $\frac{1}{5}$ and the decimal 0.2 on a number line.

The answer is shown in Figure 13. The number line has two scales that are divided into tenths. The fraction $\frac{1}{5}$ is shown on the upper scale. The decimal 0.2 is shown on the lower scale. You can see that they are in the same position. So $\frac{1}{5}$ = 0.2. (Note that $\frac{1}{5} = \frac{2}{10}$.)

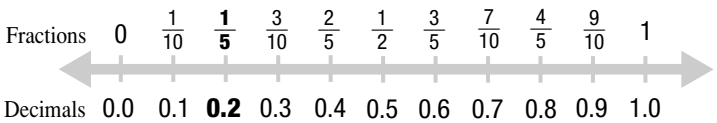


Figure 13

22. Label the fraction $\frac{47}{100}$ and the decimal 0.47 on a number line. **Example 22**

The answer is shown in Figure 14. The number line has two scales that are divided into hundredths. The fraction $\frac{47}{100}$ is shown on the upper scale. The decimal 0.47 is shown on the lower scale. You can see that they are in the same position.

So $\frac{47}{100} = 0.47$.

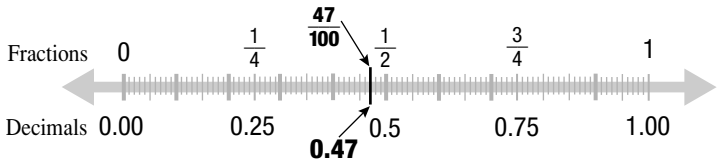


Figure 14

23. Maria is building a shelf for her son's soccer trophies. The numbers on her plan are in decimals. They show that she needs to drill a 0.25 inch hole. But the drill bit sizes are in fractions. Use the number line shown in Figure 15 to determine the right size drill bit that Maria should use. **Example 23**

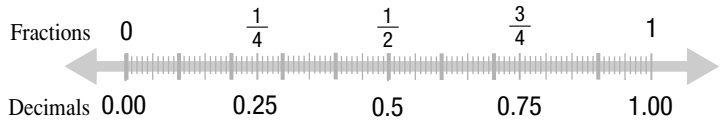


Figure 15

The number line in Figure 15 has two scales that are divided into hundredths. The decimal 0.25 is shown on the lower scale. You can see that on the upper scale this corresponds to the fraction $\frac{1}{4}$. So 0.25 = $\frac{1}{4}$. Maria should use a $\frac{1}{4}$ inch drill bit. (Note that $\frac{1}{4} = \frac{25}{100}$.)

How to Write Some Decimal Numbers as Fractions

You have already used the number line to write some decimals as fractions.

Here is one way to write some decimals as fractions without a number line. For example, to write the decimal 0.8 as a fraction:

- Read the name of the decimal. — *eight tenths*
- Write the fraction with the same name. — $\frac{8}{10}$
- Simplify the fraction to lowest terms. — $\frac{4}{5}$

24. Write the decimal 0.4 as a fraction. **Example 24**

- *Read the name of the decimal.* — *four tenths*
- *Write the fraction with the same name. Here, the denominator is 10.* — $\frac{4}{10}$
- *Simplify the fraction to lowest terms by dividing top and bottom by 2.* — $\frac{2}{5}$

You may find these Examples useful while doing the homework for this section.

Example 25

25. Write the decimal 0.65 as a fraction.

• *Read the name of the decimal.*	*sixty-five hundredths*
• *Write the fraction with the same name. Here, the denominator is 100.*	$\frac{65}{100}$
• *Simplify the fraction to lowest terms by dividing top and bottom by 5.*	$\frac{13}{20}$

Example 26

26. Write the decimal 8.067 as a mixed numeral.

• *Write the whole number.*	*8*
• *Read the name of the decimal.*	*sixty-seven thousandths*
• *Write the fraction with the same name. Here the denominator is 1000.*	$\frac{67}{1000}$
• *Write the mixed number.*	$8\frac{67}{1000}$

Example 27

27. Maria is drilling a hole in the wall to mount her son's trophy rack. The instructions say to use a 0.625 inch drill bit. What is this decimal number written as a fraction?

• *Read the name of the decimal.*	*six hundred twenty-five thousandths*
• *Write the fraction with the same name. Here the denominator is 1000.*	$\frac{625}{1000}$
• *Simplify the fraction to lowest terms by dividing top and bottom by 125.*	$\frac{5}{8}$

So Maria should use a $\frac{5}{8}$ *inch drill bit.*

How to Write Some Fractions as Decimals

Some fractions have denominators that are a power of ten, such as 10, 100, or 1000.

To write such a fraction as a decimal:
- Read the name of the fraction.
- Write the decimal with the same name.

Other fractions have denominators that are not a power of ten, but can be rewritten as a power of ten.

For example, $\frac{1}{5}$ can be rewritten as $\frac{2}{10}$.

To write such a fraction as a decimal:

- Rewrite the fraction by multiplying the numerator and denominator by a number that will make the new denominator a power of 10.
- Read the name of the fraction.
- Write the decimal with the same name.

Another way to write such a fraction as a decimal is to use the division key on your calculator. For example, using your calculator with the fraction $\frac{7}{8}$, $7 \div 8 = 0.875$.

Some fractions cannot be rewritten so that their denominator is a power of ten. For example, the fraction $\frac{1}{3}$ has a denominator, 3, that does not divide evenly into 10, 100, 1000, or any power of ten.

When you use division to write the fraction $\frac{1}{3}$ as a decimal, you get 0.333333333… .

This is a decimal that keeps going forever. It is called a non-terminating decimal. (In contrast, a terminating decimal is a decimal such as 0.379, that stops.)

The decimal 0.333333333… has a pattern that repeats. In this case, just the 3 repeats.

You can use a bar over the 3 to indicate that it repeats: $\frac{1}{3} = 0.33333333333\ldots = 0.\overline{3}$.

Terminating decimals and non-terminating decimals that have a pattern that repeats can be written as fractions. For example, the decimal 0.7 terminates. It can be written as the fraction $\frac{7}{10}$.

As another example, the non-terminating and repeating decimal $0.\overline{05}$ can be written as the fraction $\frac{5}{99}$. You can check this by dividing 5 by 99 on your calculator.

You get $\frac{5}{99} = 0.0505050505\ldots = 0.\overline{05}$. Here the numbers 05 repeat.

There are also some non-terminating decimals that don't have a pattern that repeats. Such decimals are called irrational numbers. Irrational numbers cannot be written as fractions. An example is $3.3166247\ldots = \sqrt{11}$. You will work with such irrational numbers later.

You may find these Examples useful while doing the homework for this section.

Example 28

28. Write the fraction $\frac{457}{1000}$ as a decimal.

Here the denominator, 1000, is a power of ten.
So here's how to write the fraction as a decimal.

- *Read the name of the fraction.* — *four hundred fifty-seven thousandths*
- *Write the decimal.* — *0.457*

So $\frac{457}{1000} = 0.457$.

Example 29

29. Write the fraction $\frac{1}{4}$ as a decimal.

Here the denominator, 4, is not a power of ten,
but 4 does divide evenly into 100: 100 ÷ 4 = 25.
So here's how to write the fraction as a decimal.

- *Rewrite the fraction with denominator 100.* — $\frac{1}{4} = \frac{1 \times 25}{4 \times 25} = \frac{25}{100}$
- *Read the name of the fraction.* — *twenty-five hundredths*
- *Write the decimal.* — *0.25*

So $\frac{1}{4} = 0.25$.

Example 30

30. Write the fraction $\frac{3}{8}$ as a decimal.

Here the denominator, 8, is not a power of ten,
but 8 does divide evenly into 1000: 1000 ÷ 8 = 125.
So here's how to write the fraction as a decimal.

- *Rewrite the fraction with denominator 1000.* $\frac{3}{8} = \frac{3 \times 125}{8 \times 125} = \frac{375}{1000}$
- *Read the name of the fraction.* *three hundred seventy-five thousandths*
- *Write the decimal.* *0.375*

So $\frac{3}{8} = 0.375$.

Example 31

31. Jim wants to weigh $\frac{4}{5}$ pounds of potatoes. His only measuring scale has a digital decimal display. What should it read to give Jim the correct weight?

Jim needs to write the fraction $\frac{4}{5}$ *as a decimal.*

Here the denominator 5, is not a power of ten,
but 5 does divide evenly into 10: 10 ÷ 5 = 2.
So here's how to write the fraction as a decimal.

- *Rewrite the fraction with denominator 10.* $\frac{4}{5} = \frac{4 \times 2}{5 \times 2} = \frac{8}{10}$
- *Read the name of the fraction.* *eight tenths*
- *Write the decimal.* *0.8*

So the scale should read 0.8 pounds.

Example 32

32. The four best players on a soccer team have the following ratios of goals scored to shots attempted:

Chan	6 out of 10	$\frac{6}{10}$
Rand	13 out of 20	$\frac{13}{20}$
Mia	17 out of 25	$\frac{17}{25}$
Pam	19 out of 40	$\frac{19}{40}$

Which player has the best record? Write each fraction as a decimal to see which ratio is the greatest.

$\frac{6}{10} = 0.6$

$\frac{13}{20} = \frac{13 \times 5}{20 \times 5} = \frac{65}{100} = 0.65$

$\frac{17}{25} = \frac{17 \times 4}{25 \times 4} = \frac{68}{100} = 0.68$

$\frac{19}{40} = \frac{19 \times 25}{40 \times 25} = \frac{475}{1000} = 0.475$

The decimal 0.68 is the greatest. So the fraction $\frac{17}{25}$ *is the greatest. Mia has the best record.*

You can also solve this problem on your calculator by using the division key to obtain each decimal. For example, using your calculator with the fraction $\frac{13}{20}$*, you get 13 ÷ 20 = 0.65.*

33. Write the fraction $\frac{2}{3}$ as a decimal.

Example 33

Here, the denominator, 3, does not divide evenly into any power of 10. So this fraction cannot be rewritten with a denominator that is a power of 10.

Use a calculator to divide 2 by 3: $2 \div 3 = 0.66666666\ldots$

This is a repeating, non-terminating decimal.
It can be written as $\frac{2}{3} = 0.66666666\ldots = 0.\overline{6}$.

You can also round $0.\overline{6}$ to any decimal place. To the nearest hundredth, you get 0.67.

34. Write the fraction $\frac{2}{7}$ as a decimal.

Example 34

Here the denominator, 7, does not divide evenly into any power of 10. So this fraction cannot be rewritten with a denominator that is a power of 10.

Use a calculator to divide 2 by 7: $2 \div 7 = 0.28571428571428\ldots$

This is a repeating, non-terminating decimal.
It can be written as $\frac{2}{7} = 0.28571428571428\ldots = 0.\overline{285714}$.

You can also round $0.\overline{285714}$ to any decimal place. To the nearest thousandth, you get 0.286

35. Write the fraction $\frac{16}{9}$ as a decimal.

Example 35

Here, the denominator, 9, does not divide evenly into any power of 10. So this fraction cannot be rewritten with a denominator that is a power of 10.

Use a calculator to divide 16 by 9: $16 \div 9 = 1.7777\ldots$

This is a repeating, non-terminating decimal.
It can be written as $\frac{16}{9} = 1.7777\ldots = 1.\overline{7}$.

You can also round $1.\overline{7}$ to any decimal place. To the nearest thousandth, you get 1.778.

Explore

This Explore contains two investigations.

- **Using Decimals to Compare Data**
- **The Dewey Decimal System**

You have been introduced to these investigations in the Explore module of this lesson on the computer. You can complete them using the information given here.

Investigation 1: Using Decimals to Compare Data

a. The table in Figure 16 lists the support that community colleges in a particular state received in previous years from state funding and from local funding. In addition, it lists the total funding from both sources. And, it compares the state funding to the total funding using a fraction and a decimal. Fill in the missing entries in the table.

Community College Funding (in millions of dollars)					
Year	**State Funding**	**Local Funding**	**Total Funding**	**State Funding to Total Funding (Fraction)**	**State Funding to Total Funding (Decimal)**
1991 – 1992	1,694	844	2,538	$\frac{1694}{2538}$	0.667
1992 – 1993	1,263	1,013			
1993 – 1994	978	1,276			
1994 – 1995	1,107	1,366			

Figure 16

b. Order the years from greatest to least state funding compared to total funding. Use the last column of Figure 16 to help you.

c. Collect some data that allows you to do a comparison like the one above. Below is one possibility, but feel free to use a different situtation.

- Look up population data for two states. In Figure 17, record the population in 10-year intervals; for example, 1900, 1910, 1920, etc. For each year, also record the total population of both states, and the comparison of the population of state 1 to the total population. Order the years from greatest to least population of state 1 to the total population.

Year	**Population of State 1**	**Population of State 2**	**Total Population (State 1 + State 2)**	**Population State 1 to Total Population (Fraction)**	**Population State 1 to Total Population (Decimal)**
1900					
1910					
1920					
1930					
etc.					

Figure 17

Investigation 2: The Dewey Decimal System

The American librarian Melvil Dewey (1851-1931) invented the library classification system known as the Dewey decimal system. It is used in many libraries to arrange books in order on the shelves.

In this system, each book has a "call number" which contains a decimal. For example, Figure 18 shows the call numbers of some books in the library. (Any letters at the end of the call numbers have been ignored.)

Call Number	Author	Title
690.11	Brown, R.	*Residential Foundations*
690.8	Blackburn, G.	*Illustrated Housebuilding*
692.1	McDonnel. L.	*Blueprint Reading*
690.81	Anderson, L.	*Build Your Own Low Cost Home*

Figure 18

a. Rearrange the titles above in order from the least to the greatest decimal call number. Use the table in Figure 19.

Call Number	Author	Title

Figure 19

b. Visit your school or local library. In Figure 20, record the call numbers, authors, and titles of ten books on different shelves. Choose the books so that they all have different call numbers (ignore letters at the end of the call number).

Call Number	Author	Title

Figure 20

c. Rearrange the books in order from the least to the greatest decimal call number. Use the table in Figure 21.

Call Number	Author	Title

Figure 21

Homework

CONCEPT 1: DECIMAL NOTATION

Decimal Notation

For help working these types of problems, go back to Examples 1–3 in the Explain section of this lesson.

1. Valentino has saved $483.45 for a trip to the Super Bowl. Which digits represent the whole number of dollars that he has saved?

2. Jose has saved $527.83 for a trip to the Super Bowl. Which digits represent the whole number of dollars that he has saved?

3. Which digits in $527.83 represent part of a dollar?

4. Which digits in $483.45 represent part of a dollar?

5. Which digits in 12,983.732 represent a whole number?

6. Which digits in 12,983.732 represent part of a whole number?

7. Thao's college savings account contains $1256.91.
   a. Which digits represent the whole number of dollars in Thao's account?
   b. Which digits represent the part of a dollar in Thao's account?

8. Mai's college savings account contains $3488.66.
   a. Which digits represent the whole number of dollars in Mai's account?
   b. Which digits represent the part of a dollar in Mai's account?

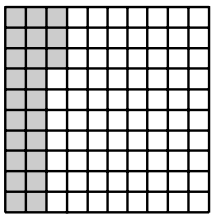


Figure 22

9. a. Represent the shaded part of the 100-square grid shown in Figure 22 as a fraction of the whole grid.
   b. Represent the shaded part of the 100-square grid shown in Figure 22 as a decimal.

10. a. Represent the shaded part of the 100-square grid shown in Figure 23 as a fraction of the whole grid.
    b. Represent the shaded part of the 100-square grid shown in Figure 23 as a decimal.

11. a. Shade squares on a 100-square grid like the one shown in Figure 24 to represent the decimal 0.01.
    b. Represent the shaded part of your grid as a fraction of the whole grid.

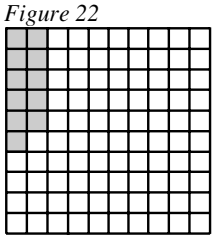


Figure 23

12. a. Shade squares on a 100-square grid like the one shown in Figure 24 to represent the decimal 0.03.
    b. Represent the shaded part of your grid as a fraction of the whole grid.

13. a. Shade squares on a 100-square grid like the one shown in Figure 24 to represent the decimal 0.57.
    b. Represent the shaded part of your grid as a fraction of the whole grid.

14. a. Shade squares on a 100-square grid like the one shown in Figure 24 to represent the decimal 0.71.
    b. Represent the shaded part of your grid as a fraction of the whole grid.

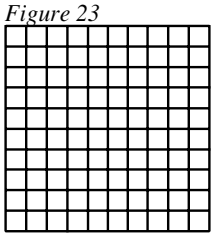


Figure 24

15. Tom is cleaning a set of vertical window blinds that consists of ten panels.
    a. Shade strips on a 10-grid like the one shown in Figure 25 to illustrate that Tom has cleaned 4 of the 10 panels.
    b. Represent the same number of panels as a fraction of the whole set of blinds.

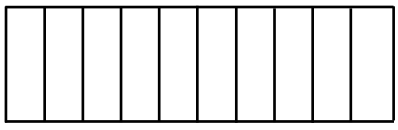


Figure 25

16. Lincoln is cleaning a set of vertical window blinds that consist of ten panels.
    a. Shade strips on a 10-grid like the one shown in Figure 25 to illustrate that Lincoln has cleaned 6 of the 10 panels.
    b. Represent the same number of panels as a fraction of the whole set of blinds.

17. Hieu has cut a rectangular pound cake into 10 slices.
    a. Shade strips on a 10-grid like the one shown in Figure 25 to illustrate that Hieu has eaten 7 of the 10 slices.
    b. Represent the same number of slices as a fraction of the whole cake.

18. Suzanne has cut a rectangular pound cake into 10 slices.
    a. Shade strips on a 10-grid like the one shown in Figure 25 to illustrate that Suzanne has eaten 3 of the 10 slices.
    b. Represent the same number of slices as a fraction of the whole cake.

19. Hank is painting the wall of his garage in ten different colored stripes. The shaded portion of Figure 26 shows how much he has painted so far.
    a. Represent the shaded portion of the picture as a decimal.
    b. Represent the shaded portion of the picture as a fraction of the whole picture.

Figure 26

20. Quin is painting the wall of her garage in ten different colored stripes. The shaded portion of Figure 27 shows how much she has painted so far.
    a. Represent the shaded portion of the picture as a decimal.
    b. Represent the shaded portion of the picture as a fraction of the whole picture.

Figure 27

21. Figure 28 shows a representation of 100 mailboxes arranged on a wall. The ones that contain mail have been shaded.
    a. Represent the number of mailboxes that contain mail as a decimal of all the mailboxes.
    b. Represent the number of mailboxes that contain mail as a fraction of all the mailboxes.

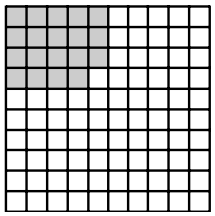


Figure 28

22. Figure 29 shows a representation of 100 mailboxes arranged on a wall. The ones that contain mail have been shaded.
    a. Represent the number of mailboxes that contain mail as a decimal of all the mailboxes.
    b. Represent the number of mailboxes that contain mail as a fraction of all the mailboxes.

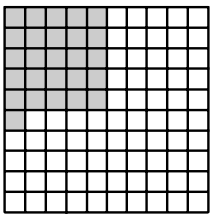


Figure 29

23. Figure 28 shows a representation of 100 mailboxes arranged on a wall. The ones that contain mail have been shaded.
    a. Represent the number of **empty** mailboxes as a decimal of all the mailboxes.
    b. Represent the number of **empty** mailboxes as a fraction of all the mailboxes.

24. Figure 29 shows a representation of 100 mailboxes arranged on a wall. The ones that contain mail have been shaded.
    a. Represent the number of **empty** mailboxes as a decimal of all the mailboxes.
    b. Represent the number of **empty** mailboxes as a fraction of all the mailboxes.

The Place Value of Digits in a Decimal Number

For help working these types of problems, go back to Examples 4–8 in the Explain section of this lesson.

25. Huy has $1826.59 in his savings account.
    a. What is the number in the hundredths place?
    b. What is the number in the hundreds place?

26. Joyce has $1932.48 in her savings account.
    a. What is the number in the tenths place?
    b. What is the number in the tens place?

27. The odometer on Fran's car reads 27,032.9 miles.
    a. What is the number in the tenths place?
    b. What is the number in the thousands place?

28. The odometer on Ian's car reads 59,763.8 miles.
    a. What is the number in the tenths place?
    b. What is the number in the hundreds place?

29. The winner in a downhill ski race was timed at 1.134 minutes.
    a. What is the number in the thousandths place?
    b. What is the number in the ones place?

30. The winner in a bicycle race was timed at 36.352 minutes.
    a. What is the number in the thousandths place?
    b. What is the number in the tens place?

31. Huy has $1826.59 in his savings account.
    a. What value does the number in the thousands place represent?
    b. What value does the number in the tenths place represent?

32. Joyce has $1932.48 in her savings account.
    a. What value does the number in the hundreds place represent?
    b. What value does the number in the tenths place represent?

33. The odometer on Fran's car reads 27,032.9 miles.
    a. What value does the number in the tenths place represent?
    b. What value does the number in the ten-thousands place represent?

34. The odometer on Ian's car reads 59,763.8 miles.
    a. What value does the number in the tenths place represent?
    b. What value does the number in the thousands place represent?

35. The winner in a downhill ski race was timed at 1.134 minutes.
    a. What value does the number in the ones place represent?
    b. What value does the number in the thousandths place represent?

36. The winner in a bicycle race was timed at 36.352 minutes.
    a. What value does the number in the tens place represent?
    b. What value does the number in the hundredths place represent?

37. Write out 3.48 by putting the correct value in each blank: $3.48 = (3 \times \_\_\_\_\_) + (4 \times \_\_\_\_) + (8 \times \_\_\_\_\_)$

38. Write out 7.18 by putting the correct value in each blank: $7.18 = (7 \times \_\_\_\_\_) + (1 \times \_\_\_\_) + (8 \times \_\_\_\_\_)$

39. Write out 59.3 by putting the correct value in each blank: $59.3 = (5 \times \_\_\_\_\_) + (9 \times \_\_\_\_) + (3 \times \_\_\_\_\_)$

40. Write out 64.7 by putting the correct value in each blank: $64.7 = (6 \times \_\_\_\_\_) + (4 \times \_\_\_\_) + (7 \times \_\_\_\_\_)$

41. Using place values, write out the number 528.356.

42. Using place values, write out the number 734.125.

43. Using place values, write out the number 27,531.28.

44. Using place values, write out the number 38,516.87.

45. When you put the decimal number 5499.37 in a place value chart:
    a. what number goes in the hundredths column?
    b. what number goes in the thousands column?

46. When you put the decimal number 243.56 in a place value chart:
    a. what number goes in the hundredths column?
    b. what number goes in the hundreds column?

47. When you put the decimal number 3456.789 in a place value chart:
    a. what number goes in the tenths column?
    b. what number goes in the hundreds column?

48. When you put the decimal number 15,624.738 in a place value chart:
    a. what number goes in the thousandths column?
    b. what number goes in the hundreds column?

How to Read and Write Decimal Numbers

For help working these types of problems, go back to Examples 9–11 in the Explain section of this lesson.

49. Write in words each of these decimal numbers:
    a. 0.5
    b. 0.53
    c. 0.503

50. Write in words each of these decimal numbers:
    a. 0.4
    b. 0.41
    c. 0.401

51. Write in words each of these decimal numbers:
    a. 0.7
    b. 0.704
    c. 0.74
    d. 0.074

52. Write in words each of these decimal numbers:
    a. 0.2
    b. 0.206
    c. 0.26
    d. 0.026

53. Harold has just bought a train ticket for $237.41
    a. Write in words the value of the number 4, as a part of a dollar.
    b. Write in words the value of the numbers 41, as a part of a dollar.

54. Lupe has just bought an airline ticket for $435.76.
    a. Write in words the value of the number 6, as a part of a dollar.
    b. Write in words the value of the numbers 76, as a part of a dollar.

55. Aidalyn has just measured the weight of a load of coffee beans as 1761.85 pounds. Write this weight in words.

56. Michael has just measured the weight of a load of concrete as 563.49 pounds. Write this weight in words.

57. Write in words each of these decimal numbers:
    a. 0.7
    b. 0.70
    c. 0.700

58. Write in words each of these decimal numbers:
    a. 0.2
    b. 0.20
    c. 0.200

59. Write in words each of these decimal numbers:
    a. 0.48
    b. 0.482

60. Write in words each of these decimal numbers:
    a. 0.57
    b. 0.570

61. Write in words each of these decimal numbers:
    a. 0.8
    b. 0.08
    c. 0.008

62. Write in words each of these decimal numbers:
    a. 0.5
    b. 0.05
    c. 0.005

63. Write in words each of these decimal numbers:
    a. 0.52
    b. 0.502
    c. 0.052

64. Write in words each of these decimal numbers:
    a. 0.43
    b. 0.403
    c. 0.043

65. The judges in a skating event have given Kristi a score of 5.8. What value does the number 8 represent? Express your answer in words.

66. The judges in a skating event have given Rudy a score of 5.7. What value does the number 7 represent? Express your answer in words.

67. Write each of the following as a decimal number:
    a. eighteen and six tenths
    b. eighteen and six hundredths

68. Write each of the following as a decimal number:
    a. fifteen and seven tenths
    b. fifteen and seven hundredths

69. Write each of the following as a decimal number:
    a. eight hundred forty-three and seven hundredths
    b. eight hundred forty-three and seven thousandths

70. Write each of the following as a decimal number:
    a. two hundred seventy-three and forty-six hundredths
    b. two hundred seventy-three and forty-six thousandths

71. The selling price of gasoline at a certain gas station is one dollar and three cents. Write this as a decimal.

72. The selling price of gasoline at a certain gas station is one dollar and seven cents. Write this as a decimal.

How to Order Decimal Numbers

For help working these types of problems, go back to Examples 12–16 in the Explain section of this lesson.

73. Draw two ten-grids like the one shown in Figure 30.
    Shade stripes on one grid to represent the decimal number 0.4.
    Shade stripes on the other grid to represent the decimal number 0.7.
    Use your grids to order the two decimal numbers from least to greatest.

Figure 30

74. Draw two ten-grids like the one shown in Figure 30.
    Shade stripes on one grid to represent the decimal number 0.3.
    Shade stripes on the other grid to represent the decimal number 0.8.
    Use your grids to order the two decimal numbers from least to greatest.

75. Draw two 100-square grids like the one shown in Figure 31.
    Shade squares on one grid to represent the decimal number 0.46.
    Shade squares on the other grid to represent the decimal number 0.31.
    Use your grids to order the two decimal numbers from greatest to least.

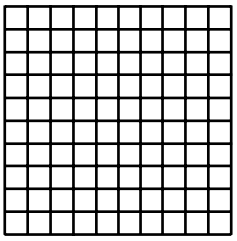


Figure 31

76. Draw two 100-square grids-grids like the one shown in Figure 31.
    Shade squares on one grid to represent the decimal number 0.27.
    Shade squares on the other grid to represent the decimal number 0.35.
    Use your grids to order the two decimal numbers from greatest to least.

77. Draw three 100-square grids like the one shown in Figure 31.
    Shade squares on one grid to represent the decimal number 0.5.
    Shade squares on another grid to represent the decimal number 0.51.
    Shade squares on the third grid to represent the decimal number 0.49.
    Use your grids to order the three decimal numbers from least to greatest.

78. Draw three 100-square grids like the one shown in Figure 31.
    Shade squares on one grid to represent the decimal number 0.2.
    Shade squares on another grid to represent the decimal number 0.27.
    Shade squares on the third grid to represent the decimal number 0.47.
    Use your grids to order the three decimal numbers from least to greatest.

79. Without using pictures, order the decimal numbers 0.71, 0.7, and 0.07 from least to greatest.

80. Without using pictures, order the decimal numbers 0.32, 0.3, and 0.03 from least to greatest.

81. The decimal numbers 0.53, 0.531, and 0.513 represent the lengths of three different steel rods, measured in centimeters. Without using pictures, write the lengths of the rods in order from shortest to longest.

82. The decimal numbers 0.42, 0.412, and 0.421 represent the lengths of three different bolts, measured in inches. Without using pictures, write the lengths of the bolts in order from shortest to longest.

83. The decimal numbers 0.7, 0.72, 0.702, and 0.722 represent the portion of water in four different samples of the same juice. Without using pictures, arrange the numbers in order from greatest to least.

84. The decimal numbers 0.5, 0.51, 0.511, and 0.501 represent the portion of white paint in four different samples of the same color paint. Without using pictures, arrange the numbers in order from greatest to least.

85. Order the fractions $\frac{8}{10}$, $\frac{82}{100}$, and $\frac{799}{1000}$ from least to greatest.

86. Order the fractions $\frac{5}{10}$, $\frac{51}{100}$, and $\frac{501}{1000}$ from least to greatest.

87. Order the fractions $\frac{1}{10}$, $\frac{9}{100}$, $\frac{92}{1000}$, and $\frac{89}{1000}$ from least to greatest.

88. Order the fractions $\frac{7}{10}$, $\frac{69}{100}$, $\frac{701}{1000}$, and $\frac{710}{1000}$ from least to greatest.

89. Three different samples of insulating material were cut from a large roll and measured to be $\frac{7}{10}$, $\frac{72}{100}$, and $\frac{68}{100}$ yards long, respectively. Write these lengths in order, from greatest to least.

90. Three different samples of curtain fabric were measured to be $\frac{3}{10}$, $\frac{31}{100}$, and $\frac{29}{100}$ yards long, respectively. Write these lengths in order, from greatest to least.

91. Arrange the digits 3, 7, 4, and 8 to form the decimal number 0._ _ _ _ with the greatest possible value.

92. Arrange the digits 2, 7, 5, and 4 to form the decimal number 0._ _ _ _ with the greatest possible value.

93. Arrange the digits 2, 8, 1, 5, and 6 to form the decimal number _._ _ _ _ with the least possible value.

94. Arrange the digits 1, 7, 3, 5, and 4 to form the decimal number _._ _ _ _ _ with the least possible value.

95. Arrange the digits 2, 7, 9, and 6 to form the decimal number 0._ _ _ _ with the greatest possible value. Then arrange the same digits to form another decimal number 0._ _ _ _ with the least possible value.

96. Arrange the digits 1, 7, 3, and 6 to form the decimal number 0._ _ _ _ with the greatest possible value. Then arrange the same digits to form another decimal number 0._ _ _ _ with the least possible value.

How to Round Decimal Numbers

For help working these types of problems, go back to Examples 17–19 in the Explain section of this lesson.

97. Round the decimal number 0.79 to the nearest tenth.

98. Round the decimal number 0.88 to the nearest tenth.

99. Round the decimal number 0.341156 to the nearest tenth.

100. Round the decimal number 0.271436 to the nearest tenth.

101. Round the decimal number 0.45 to the nearest tenth.

102. Round the decimal number 0.55 to the nearest tenth.

103. Round the decimal number 0.439 to the nearest tenth.

104. Round the decimal number 0.445 to the nearest tenth.

105. A calculator shows a sales tax of $56.14328. Round this number to the nearest cent (hundredths place).

106. A calculator shows a sales tax of $73.15187. Round this number to the nearest cent (hundredths place).

107. A store receipt shows a sales tax of $17.153. Round this number to the nearest cent (hundredths place).

108. A store receipt shows a sales tax of $27.266. Round this number to the nearest cent (hundredths place).

109. Lisa calculates the average time it takes fifteen of her friends to run a mile. Her calculator shows 9.61352 minutes. Round this number to the nearest hundredth.

110. Alice calculates the average time it takes ten of her friends to run a mile. Her calculator shows 8.7853592 minutes. Round this number to the nearest hundredth.

111. Sam calculates the average height of twenty-three of his friends. His calculator shows 5.816499 feet. Round this number to the nearest hundredth.

112. Paul calculates the average height of fourteen of his friends. His calculator shows 5.948726 feet. Round this number to the nearest hundredth.

113. Round the decimal number 0.15197 to the nearest thousandth.

114. Round the decimal number 0.14231 to the nearest thousandth.

115. Round the decimal number 0.23456789 to the nearest thousandth.

116. Round the decimal number 0.917804 to the nearest thousandth.

117. Renee calculates an average time for the five people on her swim team. Her calculator shows 2.318562 minutes. Round this number to the nearest thousandth of a minute.

118. Maya calculates an average time for the five people on her swim team. Her calculator shows 3.516462 minutes. Round this number to the nearest thousandth of a minute.

119. As part of a biology experiment, Sam measures the average length of 116 fruit flies. His calculator shows 0.13568 inch. Round this number to the nearest thousandth of an inch.

120. As part of a biology experiment, Bill measures the average length of 116 fruit flies. His calculator shows 0.297086435 inch. Round this number to the nearest thousandth of an inch.

CONCEPT 2: CONVERTING

Decimals and Fractions on the Number Line

For help working these types of problems, go back to Examples 20–23 in the Explain section of this lesson.

121. Draw two 100-square grids like the one shown in Figure 32.
On the first grid, shade the area corresponding to the fraction $\frac{1}{100}$.
On the second grid, shade the area corresponding to the decimal 0.01.

122. Draw two 100-square grids like the one shown in Figure 32.
On the first grid, shade the area corresponding to the fraction $\frac{3}{100}$.
On the second grid, shade the area corresponding to the decimal 0.03.

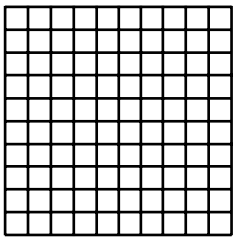


Figure 32

123. Draw one 4-grid like the one shown in Figure 33, and one 100-square grid like the one shown in Figure 32. On the first grid, shade the area corresponding to the fraction $\frac{3}{4}$. On the second grid, shade the area corresponding to the decimal 0.75.

124. Draw one 4-grid like the one shown in Figure 33, and one 100-square grid like the one shown in Figure 32. On the first grid, shade the area corresponding to the fraction $\frac{1}{2}$. On the second grid, shade the area corresponding to the decimal 0.5.

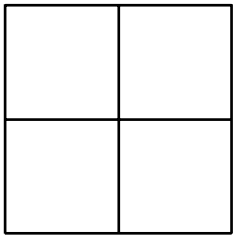


Figure 33

125. Draw two 10-grids like the one shown in Figure 34. Shade each 10-grid to show that the fraction $\frac{3}{10}$ represents the same value as the decimal 0.3.

126. Draw two 10-grids like the one shown in Figure 34. Shade each 10-grid to show that the fraction $\frac{1}{10}$ represents the same value as the decimal 0.1.

127. Draw two 10-grids like the one shown in Figure 34. Shade each 10-grid to show that the fraction $\frac{8}{10}$ represents the same value as the decimal 0.8.

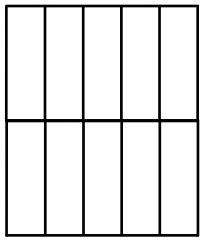


Figure 34

128. Draw two 10-grids like the one shown in Figure 34. Shade each 10-grid to show that the fraction $\frac{6}{10}$ represents the same value as the decimal 0.6.

129. Label the fraction $\frac{2}{5}$ and the decimal 0.4 on a number line like the one shown in Figure 35.

Figure 35

130. Label the fraction $\frac{4}{5}$ and the decimal 0.8 on a number line like the one shown in Figure 35.

131. Label the fraction $\frac{7}{10}$ and the decimal 0.7 on a number line like the one shown in Figure 35.

132. Label the fraction $\frac{9}{10}$ and the decimal 0.9 on a number line like the one shown in Figure 35.

133. Label the fraction $\frac{31}{100}$ and the decimal 0.31 on a number line divided into hundredths like the one shown in Figure 36.

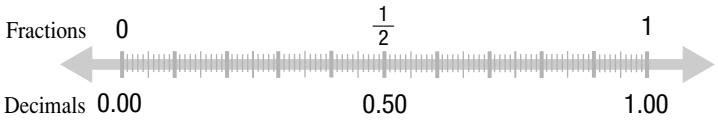


Figure 36

134. Label the fraction $\frac{17}{100}$ and the decimal 0.17 on a number line divided into hundredths like the one shown in Figure 36.

135. Label the fraction $\frac{81}{100}$ and the decimal 0.81 on a number line divided into hundredths like the one shown in Figure 36.

136. Label the fraction $\frac{63}{100}$ and the decimal 0.63 on a number line divided into hundredths like the one shown in Figure 36.

137. Tony is cutting fabric for a new dress. The pattern calls for $\frac{3}{4}$ yards of a certain fabric. His ruler is marked in decimals.

Use a number line divided into hundredths like the one shown in Figure 36 to help you write $\frac{3}{4}$ as a decimal.

138. Sheila is cutting fabric for new curtains. The pattern calls for $\frac{3}{10}$ yards of a certain fabric. Her ruler is marked in decimals.

Use a number line divided into hundredths like the one shown in Figure 36 to help you write $\frac{3}{10}$ as a decimal.

139. Helen is reading the plans for repairing her garage. The plans call for $\frac{1}{4}$ inch bolts. Her selection of bolts is marked in decimals.

Use a number line divided into hundredths like the one shown in Figure 36 to help you write $\frac{1}{4}$ as a decimal.

140. Leslie is reading the plans for assembling her new skateboard. The plans call for $\frac{1}{2}$ inch bolts. Her selection of bolts is marked in decimals. Use a number line divided into hundredths like the one shown in Figure 36 to help you write $\frac{1}{2}$ as a decimal.

141. Mark is reading a recipe that calls for 0.8 cups of flour. The only measuring cup that he can find is labeled in fractions. Use a number line divided into hundredths like the one shown in Figure 36 to help you write 0.8 as a fraction.

142. Hector is doing a chemistry experiment that calls for 0.6 mm of acid. The only measuring cylinder that he can find is labeled in fractions. Use number line divided into hundredths like the one shown in Figure 36 to help you write 0.6 as a fraction.

143. Elisa is changing the transmission fluid on her yard tractor. The specifications call for 0.85 quarts of fluid. The only measuring container that she can find is labeled in fractions. Use number line divided into hundredths like the one shown in Figure 36 to help you write 0.85 as a fraction.

144. Mai is changing the brake fluid on her yard tractor. The specifications call for 0.65 pints of fluid. The only measuring container that she can find is labeled in fractions. Use number line divided into hundredths like the one shown in Figure 36 to help you write 0.65 as a fraction.

How to Write Some Decimal Numbers as Fractions

For help working these types of problems, go back to Examples 24–27 in the Explain section of this lesson.

145. Write the decimal 0.1 as a fraction.

146. Write the decimal 0.3 as a fraction.

147. Write the decimal 0.7 as a fraction.

148. Write the decimal 0.6 as a fraction.

149. Write the decimal 0.79 as a fraction.

150. Write the decimal 0.83 as a fraction.

151. Write the decimal 0.75 as a fraction.

152. Write the decimal 0.85 as a fraction.

153. Write the decimal 0.713 as a fraction.

154. Write the decimal 0.491 as a fraction.

155. Write the decimal 0.375 as a fraction.

156. Write the decimal 0.464 as a fraction.

157. Write this decimal number as a mixed numeral: 16.35

158. Write this decimal number as a mixed numeral: 12.65

159. Write this decimal number as a mixed numeral: 9.817

160. Write this decimal number as a mixed numeral: 39.742

161. Hannah is sawing timber for a roof. She needs a beam 8.45 yards long. How will this length read on her tape measure that uses fractions?

162. Peg is sawing timber for a roof. She needs a beam 7.15 yards long. How will this length read on her tape measure that uses fractions?

163. Trinh is drilling a hole in the bathroom wall to mount a towel rack. The instructions say to make the hole 0.875 inches deep. What depth should Trinh read on his probe that is marked in fractions?

164. Willis is drilling a hole in the bathroom wall to mount a towel rack. The instructions say to make the hole 0.625 inches deep. What depth should Willis read on his probe that is marked in fractions?

165. Gerry is measuring microbes under a microscope. The scale on the microscope reads 0.0143 inches. How would Gerry write this as a fraction?

166. Colin is measuring microbes under a microscope. The scale on the microscope reads 0.0273 inches. How would Colin write this as a fraction?

167. Jean is measuring the weight of a chemical additive on her balance beam. The scale on the balance beam reads 7.245 grams. How would Jean write this as a mixed number?

168. Paula is measuring the weight of a chemical additive on her balance beam. The scale on the balance beam reads 8.345 grams. How would Paula write this as a mixed number?

How to Write Some Fractions as Decimals

For help working these types of problems, go back to Examples 28 – 35 in the Explain section of this lesson.

169. Write the fraction $\frac{3}{10}$ as a decimal.

170. Write the fraction $\frac{7}{10}$ as a decimal.

171. Write the fraction $\frac{7}{100}$ as a decimal.

172. Write the fraction $\frac{8}{100}$ as a decimal.

173. Write the fraction $\frac{231}{1000}$ as a decimal.

174. Write the fraction $\frac{249}{1000}$ as a decimal.

175. Write the fraction $\frac{17}{20}$ as a decimal.

176. Write the fraction $\frac{11}{20}$ as a decimal.

177. Write the fraction $\frac{3}{40}$ as a decimal.

178. Write the fraction $\frac{11}{40}$ as a decimal.

179. John wants to top off his radiator with $\frac{7}{8}$ of a quart of antifreeze. His measuring container is marked in decimals. How much antifreeze, written as a decimal, should he add?

180. Joe wants to top off his radiator with $\frac{3}{8}$ of a gallon of antifreeze. His measuring container is marked in decimals. How much antifreeze, written as a decimal, should he add?

181. Lindsay has recorded the following data for her soccer team:

Player	Ratio of Goals Scored to Number of Games Played
Lindsay	$\frac{4}{10}$
Elizabeth	$\frac{9}{20}$
Susan	$\frac{3}{8}$
Ian	$\frac{2}{5}$

Which player has the best ratio of goals scored to number of games played? Write each fraction as a decimal to see which ratio is the greatest.

182. Hussam has recorded the following data for his hockey team:

Player	Ratio of Goals Scored to Number of Games Played
Hussam	$\frac{5}{10}$
Chica	$\frac{5}{8}$
Daniel	$\frac{11}{20}$
Erlinda	$\frac{3}{5}$

Which player has the best ratio of goals scored to number of games played? Write each fraction as a decimal to see which ratio is the greatest.

183. Write the fraction $\frac{1}{9}$ as a decimal.

184. Write the fraction $\frac{2}{9}$ as a decimal.

185. Write the fraction $\frac{1}{6}$ as a decimal.

186. Write the fraction $\frac{1}{12}$ as a decimal.

187. Write the fraction $\frac{21}{99}$ as a decimal.

188. Write the fraction $\frac{38}{99}$ as a decimal.

189. Brian is taking 9 hours of driver training classes. After 7 hours he calculates how much of the class he has completed by dividing 7 by 9 on his calculator. What answer does he get? What answer will he get if he rounds to the thousandths place?

190. Hy is taking 9 hours of driver training classes. After 4 hours he calculates how much of the class he has completed by dividing 4 by 9 on his calculator. What answer does he get? What answer will he get if he rounds to the thousandths place?

191. It has rained 23 out of the last 77 days. Express this as a decimal by dividing 23 by 77. Then round your answer to the nearest thousandth.

192. It has rained 39 out of the last 77 days. Express this as a decimal by dividing 39 by 77. Then round your answer to the nearest thousandth.

Evaluate

Take this Practice Test to prepare for the final quiz in the Evaluate module of this lesson on the computer.

Practice Test

1. To make trail mix for backpacking, Elena mixes 3 pounds of raisins with 7 pounds of peanuts. What decimal number represents the fraction of raisins in the 10-pound mixture? What decimal number represents the fraction of peanuts?

2. Write each of the following as a decimal number:
   a. fifteen and eight hundredths
   b. nine and thirty-six thousandths

3. Arrange the following decimal numbers in order from greatest to least:
   0.03 0.30 0.29 0.31 0.003

4. Round each of the following decimal numbers.
   a. 12.3456 to the nearest thousandth
   b. 12.3456 to the nearest tenth
   c. 0.5555… to the nearest hundredth

5. Write each of the following decimal numbers as a fraction.
   Reduce each fraction to lowest terms.
   a. 0.3
   b. 0.65
   c. 0.168

6. Write each of the following fractions as a decimal number.
   a. $\frac{7}{10}$
   b. $\frac{3}{20}$
   c. $\frac{8}{11}$

7. Amy recorded the number of days of rain for three cities in Alaska. She recorded each city for a different period of time. Here are her results:

City	Number of Days of Rain	Total Number of Days Recorded
Ketchikan	17	20
Anchorage	63	100
Fairbanks	7	25

   For each city, make a fraction by putting the number of days of rain over the total number of days recorded. Find the wettest city by ordering these fractions from greatest to least.

8. Determine whether each statement is true or false.

   a. $\frac{2}{3} = 0.66666\ldots$

   b. $\frac{2}{3} = 0.67$

   c. $\frac{2}{3} = 0.\overline{6}$

   d. $\frac{2}{3}$ can be written as 0.67 rounded to the nearest hundredth.